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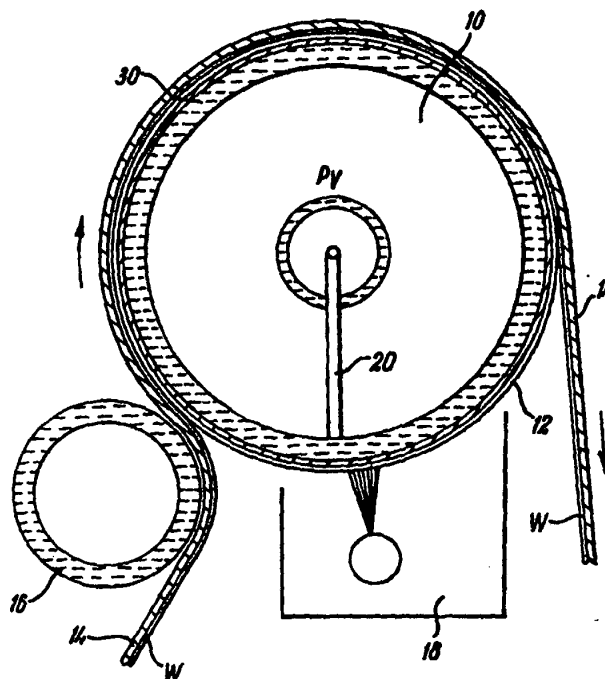
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(54) Title: IMPROVEMENTS IN ROLL COVERS

(57) Abstract

A roll cover (12), which may be in the form of a belt which is removed from contact over part of a roll, is provided with a porous nonwoven structure, for example a layer of sintered particles (55) or with or without a fabric reinforcement (57) or a layer which is rendered porous by leaching out particles or fibers, or by breaching hollow fibres (75) or which is composed by a reticulate microporous foam (60). The layer may be supported on a perforated membrane (50) or a textile base layer (62) and a nonwoven layer (54) may be provided between the support layer and the surface layer (56). The cover may provide a capillary dewatering membrane.



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IMPROVEMENTS IN ROLL COVERS

This invention relates to a dewatering membrane structure such as a roll cover for example for use as a dewatering membrane on a capillary dewatering roll, of the kind disclosed for example in U.S. 5,701,682, assigned to Kimberley-Clark Worldwide, Inc., but also applicable to all industrial rolls and rollers, especially those used in papermaking machines.

There is an ever increasing demand in present day paper machines for paper machine clothing with a fine paper-contacting surface. A fine surface is understood to mean one which is very smooth and provides a high degree of support for the paper fibres. However, there is a limit to how fine a surface can be formed on a long felt, as either the flexibility, strength, or dimensional stability of the belt will eventually be impaired.

Rolls are used in paper machines and the like in providing press-nips; and may as in CA-A-1335420 be provided with short belts in place of conventional sleeve-form roll covers.

In U.S. Patent 5,701,682 above mentioned, a paper web is passed about a substantial part of the periphery of a dewatering roll, supported on a carrier fabric. Suction is applied from the interior of the drum to draw water from the web. The roll is covered by a capillary membrane having capillary pores therethrough, which supports the fabric on the roll, and acts to cause the water to be drawn off from the web towards the interior of the

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roll.

The U.S. Patent discloses a number of capillary fabrics, comprising a composite of a capillary membrane surface, supported by one, two or three mesh layers preferably of successively coarser mesh size away from the capillary membrane, and made for example of metal or synthetic plastics material. These structures are laminated by adhesive or sinter bonding as appropriate, but are subject to delamination.

It is an object of the invention to provide a fabric for a dewatering capillary membrane such as a roll cover, felt or other fabric which has a reduced risk of delamination as compared with composite fabrics of the type set forth in the above U.S. Patent.

In accordance with the invention, this is achieved by providing a membrane, characterised in that the membrane has an outwardly presented work-contacting surface which has a porous non-woven structure. This may for example be a capillary dewatering membrane, embodied as a roll cover, or papermachine felt.

The invention also provides a capillary dewatering roll characterised in that it is provided with a capillary membrane having an outwardly presented web-contacting surface which has a porous non-woven structure.

The web-contacting surface may be provided by a coating or layer forming the outermost part of a composite roll cover structure.

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The coating or layer may contain textile reinforcement, in the form either of a woven or a non-woven fabric, or of fibres dispersed through the layer.

5 The coating or layer may comprise particles of polymeric material, or of metal, or of thermoplastic or metal fibres which are sintered, or partially fused on contacting surfaces to provide a porous layer.

A further possibility is that the coating or layer comprises a coagulated polymer, or a cloth impregnated with such a coagulated polymer.

10 The membrane or roll cover or other fabric may comprise a support layer or structure in addition to the said coating or layer comprising a fine mesh or perforated membrane of a suitable plastics material, which may include reinforcing yarns extending in the circumferential direction of the roll, and/or in the longitudinal direction of the roll, and this may include a
15 fibrous non-woven batt or felted layer laminated on the outer surface of the membrane, with the said coating or layer provided in turn on the outer surface of said non-woven layer.

The coating or layer may alternatively comprise a microporous foam, which may be reticulate, and may be applied by transfer from a release
20 medium.

The coating or layer may be of a plastics material which has been

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rendered porous by leaching out of soluble components, eg a so-called "porum", or comprise a layer made porous by embodying soluble yarns or fibres which are subsequently dissolved out to leave pores, or hollow fibres abraded to breach the fibres and provide passages through the coating or
5 layer for air or moisture.

The coating or layer may contain textile or fibre reinforcement, which may be fully embedded in the layer, or may lie below the porous coating or layer as a support.

Features of the alternative coatings or layers suggested above, may
10 be combined, for example leachable particles may be included in sintered layers, to provide enhanced porosity.

Preferred embodiments of the invention will now be further described by way of example, with reference to the accompanying drawings, wherein:-

15 Figure 1 is a diagrammatic longitudinal sectional view of a dewatering roll provided with a capillary membrane according to the invention;

Figure 2 is an enlarged diagrammatic cross-section of one embodiment of roll cover according to the invention;

20 Figure 3 is an enlarged diagrammatic cross-section of a second embodiment of roll cover according to the invention; and

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Figure 4 is an enlarged diagrammatic cross-section of a further embodiment of roll cover according to the invention.

Fig. 1 shows a dewatering roll 10, having a perforated cylinder body 30, with a syphon 20 which creates an underpressure P_v in the interior of the roll, to draw water into the interior through the cylinder body 30. A carrier fabric 14 carries a wet web W of fibrous paper precursor into contact with the roll 10, about a substantial part of the periphery of the roll so as to be subjected to suction from the interior of the roll to draw off water from the web W.

The cylinder body 30 is clad with a capillary dewatering membrane 12, through which water from the web W is led into the interior of the roll by a combination of capillary action and suction.

A cleansing shower 18 is also provided to wash the membrane 12 after the web W and its carrier fabric 14 have been drawn from the roll.

Nip roll 16 serves to apply the web 14 to the surface of roll 10.

This is substantially as described in U.S. 5,701,682 referred to hereinbefore.

Embodiments of capillary membrane fabric suitable for forming the dewatering membrane 12, in accordance with the invention will now be described by way of example, with reference to Figs. 2, 3 and 4.

Fig. 2 is an enlarged fragmentary cross-section of a capillary

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dewatering membrane such as 12, according to the invention.

A perforated membrane 50, of a plastics material such as polyamide, etc comprises apertures 51 separated by lands 52, which incorporate reinforcing yarns 53 which are disposed to run for example in the circumferential direction of the roller. Membrane 50 supports a non-woven fibrous batt or scrim layer 54 which is laminated to the membrane, and carries a surface layer 55, which provides a paper-contacting outer surface 56. Layer 55 is composed of an eg woven fabric reinforcement 57 embedded and encapsulated in the layer 55. The layer 55 comprises particles of a thermoplastic polymeric material which have been partially fused under heat and pressure to adhere together at contacting surfaces whilst leaving pores defined by interstices between the particles. The particles may be granular, or beads or spheroids, or strands, fibres or fibrils of the material.

Alternatively the layer 55 may comprise a sintered layer of metallic particles, or a layer of coagulated polymer impregnating the fabric 57 and forming a deposit on each surface of the fabric 57.

In Fig. 3, a microporous reticulate layer 60 is eg transfer coated onto a stratum 61 of polymer or metal particles which have been fused together by heat and pressure, and this structure is in turn supported by a woven fabric support 62.

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In Fig. 4, a membrane 70, with apertures 71 and lands 72 supports a sheet 73 which has been formed by weaving a fabric with hollow tubular weft threads 74, encapsulating the fabric in resin, and abrading both sides of the fabric to grind away the knuckles of threads 74 to expose the hollow
5 cores of the threads 74. These provide passages 75 from one face of the sheet 73 to the other, thereby rendering the sheet 73 porous. Sheet 73 may if desired carry a further sintered layer or microporous coating (not shown).

Capillary dewatering membranes according to the invention are
10 intended for use in particular on drums as illustrated in the above mentioned U.S. Patent, but may be used in dewatering installations in other types of papermachine.

Straight pores may be provided by sintering the metal or polymer material 55 or 61 in a circular mould, or on release medium containing pores
15 which leave holes in the layer to form the desired pores.

Fig. 5 is a longitudinal sectional view of a roller 80, having a cover 90 according to the invention, in which the flow of air is reversed with respect to that shown in Fig. 1, i.e. air is admitted via bore 85 in trunnion 84 to flow along axial shaft 86 and out into the body of the roller through
20 apertures 87, and then from the roller through apertures 88 in a cylindrical roller sleeve 81, and through the roller cover 90. This arrangement may be

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used for example in a transfer roller for transferring a paper sheet from the press to the dryer section in a papermaking machine, by blowing the sheet from the roll 80 onto a receiving fabric or roller leading into the dryer section. The fine surface of the transfer roller would reduce or prevent marking compared with the use of conventional rolls.

Roll covers according to the invention are intended for use mainly in the press and dewatering sections of a paper machine, and allows suction to be generated within the roll, as shown, to further assist dewatering. In some applications however, the suction force may be used simply to hold a sheet against the surface of the roll.

Although designed to be used in place of paper machine clothing, the roll covers can be used in place of conventional hard or soft covers in combination with a fabric.

The covers may not only be used for press rolls but also may be used for calender rolls, air impingement dryer rolls, suction or vacuum rolls, guide rolls, turning rolls, or transfer rolls in a paper machine.

In other industries, the roll covers may be adapted for use with printing rolls, corrugator machine weight roller sleeves, or for coating machine applicator etc rolls, or filtration rolls.

The dewatering membrane of the invention provides a single layer material with excellent resistance to wear and delamination, as well as

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having a finer surface which is less likely to mark a web. This fine surface will allow greater pressure to be applied to the web, increasing the rate of dewatering. Even a small increase in the web dryness caused by improved dewatering significantly reduces the energy consumption required in a subsequent through air dryer, or Yankee cylinder to dry the moist web.

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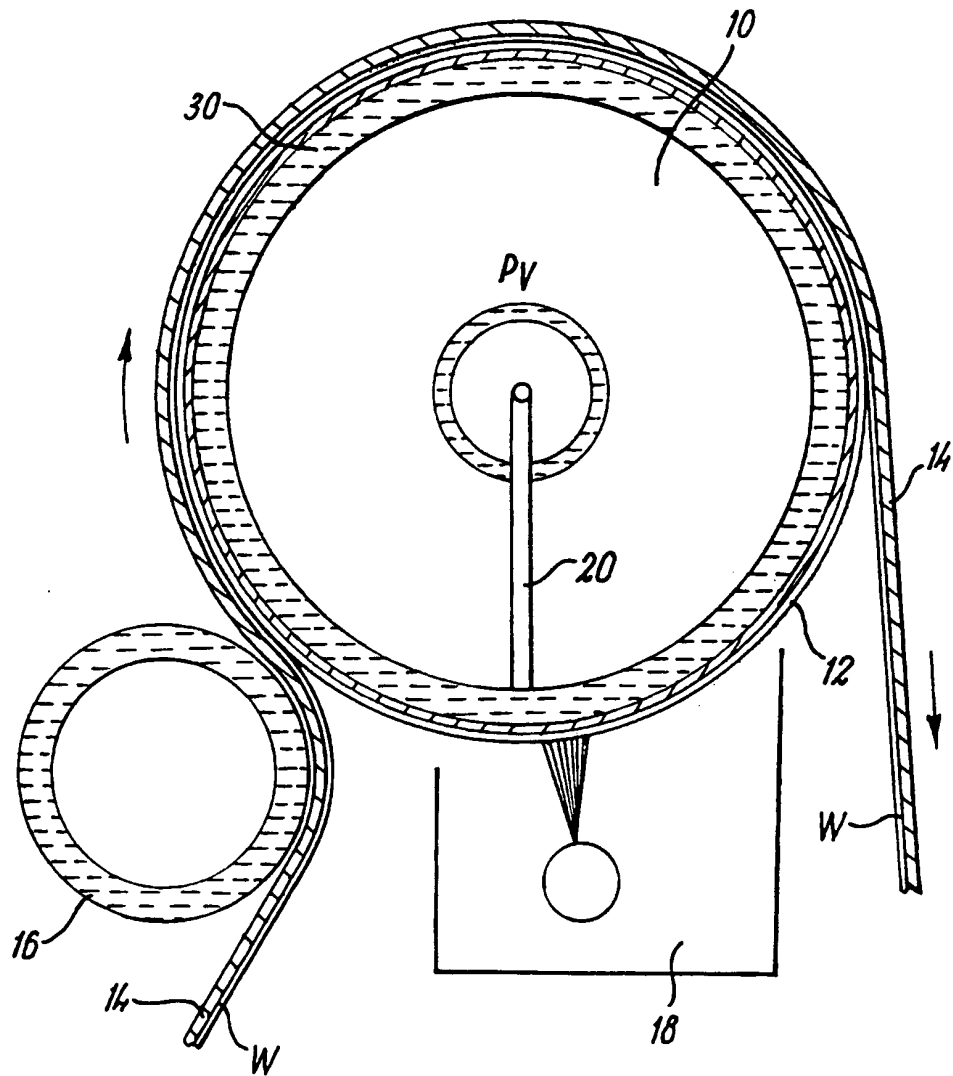
CLAIMS

1. A roll cover for a roll, characterised in that the roll cover has an outwardly presented work-contacting surface which has a porous nonwoven structure.
- 5 2. A roll cover according to claim 1 wherein said work-contacting surface is provided by a coating or layer forming the outermost part of a composite roll cover structure.
3. A roll cover according to claim 2 wherein said coating or layer contains a textile reinforcing structure in the form of a woven or
10 nonwoven fabric, or of fibres dispersed through the coating or layer.
4. A roll cover according to claim 2 wherein said coating or layer comprises a coagulated polymer.
5. A roll cover according to claim 4 wherein said coating or layer comprises a cloth impregnated with said coagulated polymer.
- 15 6. A roll cover according to any one of claims 2 to 5 wherein said roll cover further comprises a fine mesh or perforated membrane of a plastics material, in addition to said coating or layer.
7. A roll cover according to claim 6 wherein said perforated membrane includes reinforcing yarns extending in the circumferential direction
20 of the roll and/or in the longitudinal direction of the roll.
8. A roll cover according to claim 6 or 7 wherein a fibrous nonwoven

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batt of felted layer is laminated to the outer surface of the membrane, said coating or layer being in turn provided on the outer surface of the batt or felted layer.

- 5 9. A roll cover according to any of claims 2 to 8 wherein the coating or layer comprises a reticulate microporous foam.
- 10 10. A roll cover according to any of claims 2 to 8 wherein the coating or layer comprises a plastics material which has been rendered porous by leaching out soluble components.
- 11 11. A roll cover according to any of claims 2 to 8 wherein the coating or layer comprises a layer made porous by embodying soluble or hollow yarns or fibres which are subsequently respectively dissolved out to leave pores, or abraded to breach the fibres or yarns and provide passages through the coating or layer.
- 15 12. A roll cover according to claim 2 wherein said coating or layer comprises a mixture of sintered particles and leachable particles, the latter being dissolved out after sintering.
13. A roll characterised in that it is provided with a roll cover according to any one of claims 1 to 12.
- 20 14. A roll cover according to any preceding claim wherein said cover provides a capillary membrane to enable the roll to be used as a capillary dewatering roll.



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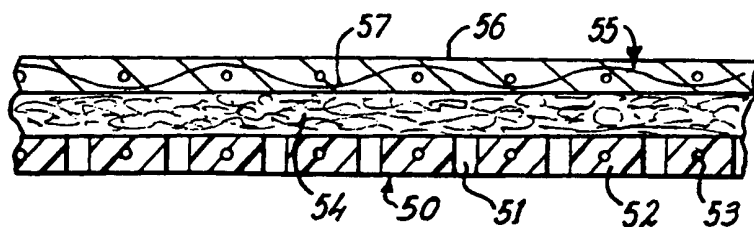


FIG. 2

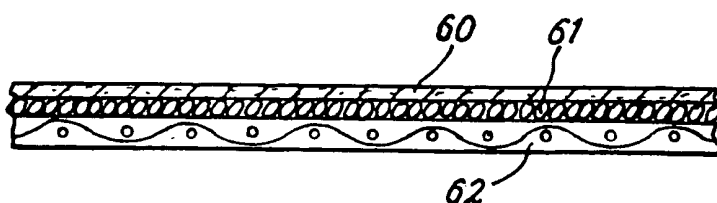


FIG. 3

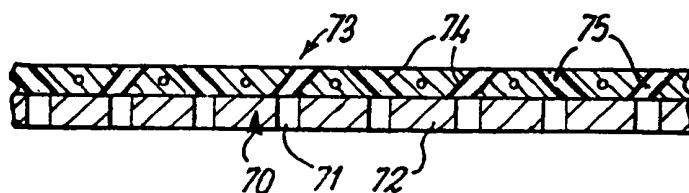


FIG. 4

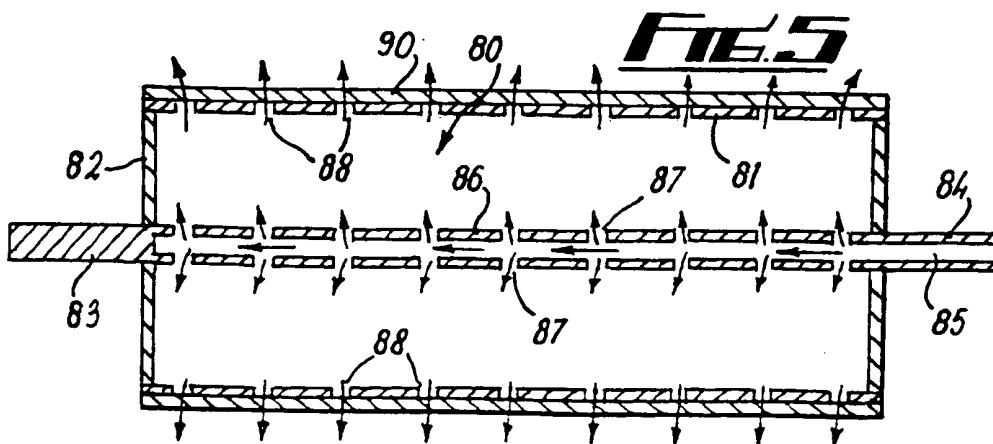


FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D21F3/10 D21F3/08 D21F5/18 B01D39/00

According to International Patent Classification (IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 197 32 994 A (SCAPA GROUP PLC) 12 February 1998 (1998-02-12) abstract; claim 1 column 1, line 1 - line 24 ---	1-5, 13
X	GB 1 090 877 A (ARTHUR D LITTLE) 15 November 1967 (1967-11-15) claims; figures ---	1, 13, 14
X	US 5 701 682 A (CHUANG STRONG C ET AL) 30 December 1997 (1997-12-30) cited in the application column 5, line 58 - column 6, line 29 ---	1, 2, 13, 14
Y	---	6, 7, 9-12
Y	US 4 740 409 A (LEFKOWITZ LEONARD R) 26 April 1988 (1988-04-26) claim 1; figures ---	6, 7
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Date of the actual completion of the international search

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 367 739 A (ALBANY INT CORP) 9 May 1990 (1990-05-09) page 2, line 55 - page 3, line 20 ---	9
Y	EP 0 786 551 A (MUNZINGER CONRAD & CIE AG) 30 July 1997 (1997-07-30) abstract ---	10,12
Y	WO 98 07925 A (SAYERS IAN CHRISTISON ; SCAPA GROUP PLC (GB)) 26 February 1998 (1998-02-26) abstract; figures ---	11
A	WO 98 01618 A (SCAPA GROUP PLC) 15 January 1998 (1998-01-15) abstract; figures -----	8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/00931

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19732994 A	12-02-1998	FR 2752173 A	13-02-1998
GB 1090877 A		NONE	
US 5701682 A	30-12-1997	US 5598643 A	04-02-1997
		AU 698155 B	22-10-1998
		AU 4100096 A	17-06-1996
		AU 6983598 A	01-10-1998
		AU 705638 B	27-05-1999
		AU 6983698 A	01-10-1998
		BR 9506569 A	02-09-1997
		CA 2181484 A	30-05-1996
		CN 1148886 A	30-04-1997
		EP 0740765 A	06-11-1996
		JP 9511568 T	18-11-1997
		WO 9616305 A	30-05-1996
		US 5699626 A	23-12-1997
US 4740409 A	26-04-1988	AT 85096 T	15-02-1993
		AU 607197 B	28-02-1991
		AU 1372388 A	29-09-1988
		CA 1309853 A	10-11-1992
		CA 1323478 A	26-10-1993
		DE 3877794 A	11-03-1993
		EP 0285376 A	05-10-1988
		FI 881493 A,B,	01-10-1988
		GB 2202873 A,B	05-10-1988
		GB 2235705 A,B	13-03-1991
		JP 1020371 A	24-01-1989
		MX 166231 B	24-12-1992
		NO 173621 C	05-01-1994
EP 0367739 A	09-05-1990	US 5118557 A	02-06-1992
		AT 132554 T	15-01-1996
		AU 608449 B	28-03-1991
		AU 3649089 A	03-05-1990
		CA 1329741 A	24-05-1994
		DE 68925345 D	15-02-1996
		DE 68925345 T	15-05-1996
		FI 892237 A,B,	01-05-1990
		JP 2127585 A	16-05-1990
		JP 2675632 B	12-11-1997
		KR 9310748 B	10-11-1993
		NO 177235 B	02-05-1995
		US 5346567 A	13-09-1994
EP 0786551 A	30-07-1997	AU 702029 B	11-02-1999
		AU 1542297 A	20-08-1997
		BR 9704640 A	09-06-1998
		CA 2214003 A	31-07-1997
		CZ 9702998 A	17-12-1997
		WO 9727361 A	31-07-1997
		EP 0817887 A	14-01-1998
		NO 974422 A	24-09-1997
		PL 322379 A	19-01-1998
		SK 129997 A	03-06-1998
WO 9807925 A	26-02-1998	AU 3948497 A	06-03-1998

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. l. Application No

PCT/GB 99/00931

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9807925 A		GB 2330844 A	05-05-1999
WO 9801618 A	15-01-1998	AU 2706397 A	02-02-1998
		AU 3602897 A	02-02-1998
		EP 0914518 A	12-05-1999
		WO 9801779 A	15-01-1998